

NASA Chat: Observe the Moon!
Experts Dr. Rene Weber and Dr. Barbara Cohen
October 6, 2011

(Moderator Brooke): Welcome everyone! Ready for your questions...

(Moderator Brooke): Welcome to the chat! This is a moderated chat. To submit your own question, please type it in the box at the bottom of the window and click the 'Ask' button on the right side of the box. Thanks for your patience as we answer your questions.

Ronnie: why is that the moon sometimes looks yellow or reddish instead of the usual white/pale white?

Barbara_Cohen: It looks yellow/red/orange when you see it through the earth's atmosphere and there's a lot of dust or smoke or something in the atmosphere. Usually, it's more prominent when the moon's low on the horizon.

J-C: Why is lunar mining for Helium-3 not important to NASA when China's space program is trying for it?

Barbara_Cohen: Helium-3 is not a currently viable fuel source on the earth. There is a lot of research and development that needs to happen before we can use Helium-3. That's why the U.S. is investing other sources of energy, like wind and solar.

Bl: What plans are there to investigate the water that was potentially found on the Moon's pole?

Barbara_Cohen: NASA has no missions currently planned to land at the Moon's poles. There are several being proposed by the science community. Meanwhile, look for GRAIL early next year that will give more information about the whole moon, including the poles.

Bl: How do we find out if there is an international Observe the Moon site near us?

Barbara_Cohen : There's a web site: <http://observethemoonnight.org>

Flower: Why does it seem the moon is closer This month then ever?

Renee_Weber: The Moon's orbit around the Earth is not a perfect circle, instead it is somewhat egg-shaped (elliptical). So, at certain times the Moon appears slightly closer. This is especially true when the Moon is near the horizon, where objects like trees and houses provide visual context.

(Moderator Brooke): Do you have questions about moon research or Observe the Moon Night? Now is your chance to ask! Renee and Barbara are working on your questions as we speak...

jeff44663: You already discussed the Moon appearing yellow or red, but why does it always appear so large when it is near the horizon?

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Barbara_Cohen: This is an optical illusion. The moon is actually the same size, but on the horizon you see it relative to familiar shapes like trees and houses so it appears bigger to your brain. You can test this by holding up your thumb to the moon when it's on the horizon and again when it's overhead. You'll see that the moon is the same size relative to your thumb.

Tcsdavis: How seismically active is the moon?

Renee_Weber: The moon experiences several different types of seismic activity. First, because the Moon has no atmosphere, many small meteorites impact on the surface (that would otherwise burn up if they were impacting, for example, the earth). Then there are somewhat larger, but relatively rare, shallow moonquakes, whose origin is unknown. Third, there are deep moonquakes, which are triggered by the tidal interaction between the earth and Moon. Last, there are shallow thermal events, caused by the extreme temperature fluctuation between the lunar day and night.

Flower: Is there any life-like Conditions on the moon?

Barbara_Cohen: Not for humans. There are resources such as water and oxygen found in the lunar regolith (soil) that we could use for humans to live there.

(Moderator Brooke): Some added information about the Hunter's Moon, for the visitor asking about that: http://en.wikipedia.org/wiki/Hunter's_moon

Flower: Could we actually live on the moon?

Renee_Weber: it would be an interesting challenge. Because of the lack of atmosphere and difficulty obtaining resources like water and building materials, all human activity would have to be supported by an Earth-based supply until a significant self-sustaining lunar outpost could be established.

StargazingEve: What's the most exciting thing that an amateur observing the moon from earth for the first time should look for?

Barbara_Cohen: To me, the most interesting thing is to look at the edge where the lit Moon and the dark shadow meet (the terminator). Along this edge, you'll see the topography of the Moon stand out, like craters and mountains.

Shaun: Why doesn't the earth's gravitational force gradually pull the moon closer to us?

Renee_Weber: The orbit of Moon has had billions of years to stabilize. The masses of both bodies and the speeds at which they orbit are governed by physical laws that apply to the entire solar system.

Ronnie: what are the useful minerals that can be found on the moon

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Barbara_Cohen: Most minerals on the Moon are similar to minerals on the Earth. There are no ore deposits because there is no flowing water, but minerals such as ilmenite (an iron-titanium oxide) could be used to extract oxygen or metals like iron and titanium.

Shaun: Can the moon ever become earths planetary ring?

Barbara_Cohen: The Moon actually started as Earth's planetary ring. Material was thrown into Earth's orbit by a giant impact and coalesced into the Moon. But it's a one-way process; it's not going to turn back into a ring.

Tcsdavis: Is the core of the moon still active? If so can we harvest any thermal enery from it?

Renee_Weber: The core of the moon is comparatively much smaller than that of the Earth. Earth's core convects (circulates) molten material, which is thought to drive the dynamo necessary to support Earth's magnetic field, as well as plate tectonics that bring hot material to the Earth's surface (mid-ocean ridges). In contrast, the Moon's core is stagnant. There are no plate tectonics on the moon, and no oceans, so thus no way to "harness" the Moon's internal source of heat.

Calum: Although the moon can't sustain any human life, is it possible that any organism could be supported in these conditions?

Barbara_Cohen: We know plants can grow in lunar soil, but they need an oxygen atmosphere, which the Moon does not have, and liquid water. We don't currently know of any microorganisms that could thrive on the current Moon without outside help.

Allesbolz: GRAIL will help to resolve the doubts about the presence of a second moon billions of years ago?

Renee_Weber: GRAIL will measure the Moon's gravity field in higher-than-ever-before resolution, which will give us information about the Moon's internal structure.

(Moderator Brooke): Lots of great questions coming in -- ask yours, too! Type it in the box at the bottom of the window and click the 'Ask' button on the right side of the box. Thanks for your patience as we answer your questions.

Serg: Hey guys!))

Renee_Weber: Welcome! Feel free to jump in with any Moon questions!

Flower: does the moon have any sort of weather exsprenices Such as ; rain snow storms etc?

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Barbara_Cohen: Weather on the Moon is what we call "space weather." It comes from the Sun and the solar wind. Sometimes the Sun ejects charged particles. We see them in the Earth's magnetic field as aurora, but on the Moon, they actually hit the surface.

StargazingEve: Why is the moon our moon, how did it get where it is now?

Renee_Weber: The Moon is actually thought to have formed from the remnants of a giant impact of a Mars-sized body with the Earth. The material ejected into space as a result of the collision coalesced into a proto-moon many billions of years ago, that evolved over time into the Moon we know today.

Jose: have any trace gasses ever been measured on the moon? as in a tiny atmosphere?

Barbara_Cohen: Yes, the Moon has a tenuous atmosphere. It's called a "surface-bound exosphere," because it doesn't behave like the Earth's atmosphere. Molecules in the Moon's atmosphere include argon, sodium and hydrogen.

Flower: what is the "dark side" to the moon?

Renee_Weber: The "dark side" of the Moon is often confused with the "far side" of the Moon. Because the Moon's rotation period and revolution period are nearly the same, here on Earth we always observe the same "face" of the Moon. The variations in the relative positions of the Sun and Moon cause all sides of the Moon to be illuminated at various times during the month. This is why we observe phases like crescent Moon, gibbous Moon, etc. The lunar day/night cycle is 2 weeks long.

Flower: Has the moon ever had a really bad hit causing a few problems? or anything ?

Barbara_Cohen: The Moon is hit all the time -- just look at all the craters. The biggest crater on the Moon can't be seen from the Earth, because it's on the far side. But you can see it on the map. It's called the South Pole-Aitken Basin. It is 2500 kilometers across!

Shaun: The LCROSS mission discovered elements which prove existence of water on the moon. Do you believe that water was always there, or could were those elements origin from Earth?

Renee_Weber: Water on the Moon was likely emplaced there billions of years ago during the "late heavy bombardment," when many water-containing comets rained down on the inner solar system.

Tcsdavis: Is there any way to tell if digging below the moon's surface one would reach a constant stable temprature?

Barbara_Cohen: Yes. Much like the Earth, the Moon does have a constant temperature at depth. We measured the Moon's temperature to about a meter deep and saw that it evened out below that depth.

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The temperature changes because of the day/night cycle and the seasons similar to the temperatures on the Earth.

kal-El_5: How is it that the moon became to be so spherical? i see other moons from other planets in our system and non are like it and are often mishaped rocks.

Renee_Weber: Planetary bodies become spherical when they acquire enough mass such that self-gravitation overcomes the cohesive properties of the rocks making up the body.

Curiosity: hello everyone, if one day I have a house with a swimming pool, could I see effects of the full moon? or is needed a big quantity of water like oceans

Renee_Weber: The tidal effect of the Moon is too small to observe in a swimming pool. It would be pretty neat, though!

Ronnie: here is a tricky one (to me:)) :why is the moon called "moon"?

Barbara_Cohen: Wikipedia says it's derived from Old English which ultimately comes from proto-German "maenon."

Flower: Whens the next lunar/ecplise?

Renee_Weber: You can check NASA's eclipse calendar at <http://eclipse.gsfc.nasa.gov/eclipse.html>

Angora: you said that plants could survive on the moon but need outside help. if water was to be provided for them is it possible that over time plants could help generate an atmosphere for the moon

Barbara_Cohen: This is called terraforming and it's a favorite of science fiction books. The Moon doesn't have enough gravity to hold onto enough oxygen and nitrogen to make a breathable atmosphere.

(Moderator Brooke): Great questions -- keep them coming, and thanks for your patience as Renee and Barbara are answering.

Flower: Why does the moon glowing i thought it was because of the reflection of the sun like a mirror it bit hard to explain .

Barbara_Cohen: Yes, that's more or less correct. When you shine a light on any object, the light that bounces off and returns to your eyes is how you see that object. The same is true of the Moon. Sunlight bounces off the Moon and into your eyes.

Turkish: when ordinary people can go moon?is it possible?what do you think about space travel?

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Renee_Weber: It will depend on the future of NASA space exploration and the astronaut program. A new astronaut announcement will open this fall for the next class of astronauts in 2013. Check here for more information! <http://astronauts.nasa.gov/>

Calum: What makes up Lunar Regolith?

Barbara_Cohen: The lunar regolith is made of broken bits of all the rocks that make up the Moon. So it's made of small bits of basalt and anorthosite, plus trace amounts of the asteroids that make the craters on the Moon.

jeff44663: I would like to start doing lunar occultation timings. Does this necessarily require a high-power telescope or can one make useful measurements with less expensive equipment or even just binoculars?

Renee_Weber: I'm not familiar with this area, but a quick Google search turned up "The International Occultation Timing Association" (<http://www.lunar-occultations.com/iota/iotandx.htm>) you might want to start there. Good luck, it sounds really interesting!

White_Oaks_Third_Grade: Did the impact experiment to find water on the Moon hurt the Moon?

Renee_Weber: Many small meteorites are constantly impacting the surface of the Moon, because the Moon has no atmosphere to protect it from the harsh environment of space. I think the Moon is used to it!

Ronnie: why can't radio waves reach the far-side of the moon?

Barbara_Cohen: Radio waves, like all electro-magnetic waves (light, x-rays, microwaves, etc.) travel in a straight line unless there is a prism to bend them. So radio waves from our Earth travel in a straight line past the Moon. So you can only pick them up on the near side. There is an idea to look for radio waves from distant stars on the far side of the Moon because there's no radio interference from the Earth.

kal-El_5: why is it that Jupiter's moon Titan having 50% the diameter and 80% the mass is odd shaped and not round like our moon. It also rotates in it's orbit, unlike our moon. This is regarding our above question on the moon being spherical. thanks.

Barbara_Cohen: Titan actually is round and tidally locked to its parent planet Saturn. Both our Moon and Titan rotate on their axis, but their rotation rate matches their orbital rate, so that we always see the same side. That's not the same as them not rotating.

Shaun: Do you think our synchronous orbit may be significantly altered due to man made forces such as gravitational assists and powerful thrusts to reach escape velocity?

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Barbara_Cohen: No. The amount of energy we "take" from the Earth and other planets for gravity assists is infinitely small and hence does not affect their orbits.

Flower: Is the moon in any danger for the future

Renee_Weber: The moon would experience the same dangers that the Earth does. A large impact, similar to the one that formed the Moon, would have catastrophic effects on both the Earth and the Moon. Fortunately, NASA monitors near-earth objects like asteroids, to track their orbits and help protect earth.

kal-El_5: regarding angora's question. Have they found atmosphere conditions in the depths of craters?

Barbara_Cohen: No. The depths of craters at the lunar poles are so cold that gases (as we know them on the Earth) are solids at those temperatures. So they don't form an atmosphere.

Flower: How long has the moon been around :)?

Renee_Weber: The Moon is thought to be about 4.5 billion years old.

StargazingEve: If I was standing on the moon right now and looking up, what would I be able to see. The same constellations as I can see from Earth?

Barbara_Cohen: Yes, depending on where you are on the Moon. We can see different constellations depending on where we are on the Earth, but the constellations would be the same from the Moon. You could also see the Earth rising, if you were in the right place.

Tbeck: To comment further on Ms. Cohen's statement, a radio observatory on the far side could receive some valuable data w/o EMI from the earth. Another thought would be to relay the gathered information to the near side for transmission to earth for analysis (possibly via TDRSS?)

Barbara_Cohen: Sure, that's a good idea. We could also put a relay satellite in orbit. There are many ways people have proposed.

Flower: Wow thats oldis there any time frame for the moon to be around?

Renee_Weber: We can only speculate as to what will happen to the Moon in the future. Assuming the Moon does not experience any catastrophic impacts, it should exist for as long as our Sun is stable.

Angora: in relation to the moon how large would an object have to be to alter its orbit?

Renee_Weber: I'm not sure, but probably pretty big! It takes a lot of energy to alter the orbit or something as large as the Moon.

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Flower: Have we always had one moon or have we had more i saw in the a couple questions ago you said about a sort of pre moon? if[im correct](?:?

Barbara_Cohen: That was an interesting idea, wasn't it? What we have now is one moon. What planetary scientist try to do is to observe what we have now and try to figure out what happened in the past. It's possible that the ring around the Earth could have coalesced into two moons that later combined into one. But without a time machine we may never know for sure.

Curiosity: without moon, how different would be life on earth? life evolution would be affected for example?

Renee_Weber: There are a lot of theories on this topic. The Moon affects the tides and associated energy in the oceans and atmosphere. This suggests that there could be an important relationship between the Moon and life. It looks like there is more to explore and read on the web!

Flower: Could we get any power from our moon i also think iv seen a bit simmler in another question

Barbara_Cohen: The best way to get power on the Moon is the pure, unfiltered solar energy. You could put enormous solar panels on the Moon. You could also break down the rocks to get oxygen, which you could use as fuel. We don't do that now because oxygen is plentiful on the Earth, but if you were living and working on the Moon, you might want it.

(Moderator Brooke): We have about 10 minutes left in the scheduled chat, so if you have questions for Renee and Barbara, now is the time to ask!

Calum: If the moon were to dissapear, what effect would this have on earth?

Barbara_Cohen: The biggest effect the Moon has on the Earth is the tides. The tidal energy is linked to many different kinds of habitats, so having no tides would be detrimental to some kinds of life on Earth. Also, we would miss the moonlight on clear nights.

Godstexangirl: Does the moon rotate in twenty-four hour days?

Renee_Weber: No, the Moon's day is about 27 Earth days long! That means "lunar day" is two weeks long and "lunar night" is two weeks long too!

Brandon: What is the possibility of having any types of architechture on the moon, such as homes or stations. Also if it were possible could we see it in our near future?

Barbara_Cohen: Right now, NASA has plans to build an enormous rocket that would be capable of lifting components we would need for missions on the lunar surface, near-earth asteroids and eventually Mars. This might not be in our near future, but I hope it's in our eventual future.

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(Moderator Brooke): We have time for one or two more questions...

Calum: How likely is another moon landing mission in the future?

Barbara_Cohen: There are many proposals from the science community to land on the Moon. I hope one of them gets picked soon. Meanwhile, next year, look for results from GRAIL, which is the set of twin satellites orbiting the Moon.

kal-El_5: Barbara and Renee.. do either of you believe in extraterrestrials? on a personal level, i know you are not speaking for Nasa.

Renee_Weber: You can look up the Drake Equation, which factors many different variables required for life into a single expression that can be either extremely pessimistic or extremely optimistic depending on the choices you input into the model. Personally, I think life beyond Earth is possible, but not necessarily complex life forms like are present here. The universe is a big place, and we will only be able to explore a tiny fraction of it in our lifetimes.

Brandon: Is it possible that any other object could come into orbit the earth just as the moon? If so, what impact would something about similar size have on our life here on earth?

Renee_Weber: We know that even mid-sized impacts can have catastrophic effects, for example, the impact that wiped out the dinosaurs. But the fraction of bodies with orbits that intersect Earth's is very small.

White_Oaks_Third_Grade: We learned a lot! Thank you!

Renee_Weber: You're welcome, thanks for joining us!

Elisebedder: I'm a librarian and would like to know if chats such as these are available for children?

(Moderator Brooke): Hi, answering on behalf of Barbara. Here are some great links for this: NES Home: <http://www.nasa.gov/offices/education/programs/national/nas2/home/index.html> Chat index: <http://www.nasa.gov/offices/education/programs/national/nas2/home/chat-index.html>

(Moderator Brooke): From Renee and Barbara: make sure you join one of the 546 events taking place in over 50 countries on Saturday night to celebrate Observe the Moon Night!

(Moderator Brooke): Thanks for joining us today. We've had some great questions and a big thanks to Renee and Barbara for sitting down with us. We'll have a transcript up in a few days. For more chats, please keep an eye on <http://www.nasa.gov/connect/chat>. Thanks again for participating.